Does the Qur’an Plagiarise Ancient Greek Embryology?

A Review

Presented by

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Summary

This paper addressed the accusation that the embryological development described in the Qur'an, has been plagiarised from the writings of ancient Greek physicians, such as Galen.

We reviewed the main embryological ideas found in the writings of the ancient Indians, Hippocrates, Aristotle, Galen, and Jewish scriptures, and compared these to the embryological development stated in the verses of the Qur'an.

It was found that there was no similarity between these ancient writings and text of the Qur’an. The Qur'anic ideas on embryology were completely different in terms of style, content and accuracy.

Hence, the charge that the Prophet and Messenger Muhammad (Allah bless him and give him peace) plagiarised the writings of the ancients was shown to be an utterly false and baseless accusation.

Contents

Introduction

This paper will examine the claim that the embryological development described in the Qur'an has been plagiarised from the writings of ancient Greek physicians, such as Galen. Hence, we will review what was known about embryology by the ancient Indians, Hippocrates, Aristotle, Galen, as well as the embryology found in Jewish scriptures. Then we will outline all the verses in the Qur’an, and some Hadith literature, regarding embryology and human development. In doing so it should be very obvious if there are any similarities or indeed outright plagiarism of Greek ideas which were prevalent at the time.

It should be emphasised that translators of the Qur’an usually translate according to their own understanding of the Arabic and choose words which they think best convey the meaning. Therefore, it is all the more important to refer back to classic Arabic dictionaries such as Lisan Al-'Arab, Taj Al-'Aroos Min jawahir Al-Qamoos, and Al-Qamoos Al-Muhit. This approach will enable us to eliminate any criticism of the Arabic translations and help us to understand in what sense the word was originally used. Another interesting aspect of Arabic is that it is a material language, in the sense that words are based and derived from everyday material things, which are easy to identify. So the Qur’anic descriptions of embryology use a simple yet comprehensive language.

1. Indian Antiquity

Ancient Indian ideas about embryology are to found in the Bhagavad Gita (2 BC) which describes structures such as the amniotic membrane. And the Susruta-samhita (2-3 AD), which says that the embryo is formed of a mixture of semen and blood (this idea was also held by the Greeks, as we shall see later), both of which originate from chyle (digested fats). The differentiation into the various parts of the body, arms and head occurs in the third month. In the fourth there follows the distinct development of thorax, abdomen and heart. Hair, nails, sinews and veins develop in the sixth month; and in the seventh month the embryo develops other things that may be necessary for it. In the eighth month a drawing of the vital force (*ojas*) to and from mother and embryo, which explains why the foetus is not yet viable. The hard parts body are derived from the father, the soft from the mother. Nourishment is carried on through vessels, which lead chyle from the mother

The factors required for the production of the foetus were thought to be

- • the father's semen

- • the mother's blood (*sonita*) or more specifically menstrual blood (*artava*)
- • the *atman*, or subtle body (consisting of fire, earth, air and water in the proper proportions)
- • the *manas* or mind, united to a particular embryo by reason of its *karma*.

The idea of the blood being menstrual blood is interesting as it closely resembles Aristotelian doctrine. The clotting of milk into cheese analogy used by Aristotle for the formation of the embryo occurs also in Indian embryology. The *Susruta-samhita* compares the creamy layers (*santanika*) formed in milk, to semen and blood, which through chemical changes caused by heat, produce seven different layers of skin (*kala*). This concept occurs again in a Sutra on embryology written in Sanskrit, "Development, 0 Ananda," Buddha is made to say, "is comparable to a vessel of milk, like as this ferments and forms a kind of *kefir* or cheese." (A history of Embryology, J. Needham pp 25-27, Cambridge, 2nd edition 1959).

2. Hippocratic Embryology

Hippocrates (460 – 377 BC) was a Greek physician and founder of the Hippocratic school of medicine. The Hippocratic collection of some 60 or so medical works is ascribed to various authors and was probably not written by Hippocrates. The embryological knowledge of Hippocrates is set out in three books, the treatise on *Regimen*, the work on *The Seed* the book on *The Nature of the Child* (Hippocratic Writings, Penguin Classics, 1983).

In the treatise on *Regimen* section 9 discusses the formation of the embryo. The description is based on the fundamental physiological idea at the time, that is the two main constituents of all natural bodies are fire and water. Both of these in turn consist of heat, dryness and moisture in differing proportions.

"Whatever may be the sex which chance gives to the embryo, it is set in motion, being humid, by fire, and thus it extracts its nourishment from the food and breath introduced into the mother. First of all this attraction is the same throughout because the body is porous but by the motion and the fire it dries up and solidifies as it solidifies, a dense outer crust is formed, and then the fire inside cannot any more draw in sufficient nourishment and does not expel the air because of the density of the surrounding surface. It therefore consumes the interior humidity. In this way parts naturally solid being up to a point hard and dry are not consumed to feed the fire but fortify and condense themselves the more the humidity disappears-these are called bones and nerves. The fire burns up the mixed humidity and forwards development towards the natural disposition of the body in this manner; through the solid and dry parts it cannot make permanent channels but it can do so through the soft wet parts, for these are all nourishment to it. There is also in these parts a certain dryness, which the fire does not consume, and they become compacted one to another. Therefore the most interior fire, being closed round on all sides, becomes the most abundant and makes the most canals for itself (for that was the wettest part) and this is called the belly. Issuing out

from thence, and finding no nourishment outside, it makes the air pipes and those for conducting and distributing food. As for the enclosed fire, it makes three circulations in the body and what were the most humid parts become the venae cavae. In the intermediate part the remainder of the water contracts and hardens forming the flesh."

Further in section 26 of the same treatise;

"Everything in the embryo is formed simultaneously. All the limbs separate themselves at the same time and so grow, none comes before or after other, but those, which are naturally bigger appear before the smaller, without being formed earlier. Not all embryos form themselves in an equal time but some earlier and some later according to whether they meet with fire and food, some have everything visible in 40 days, others in 2 months, 3, or 4. They also become visible at variable times and show themselves to the light having the blend (of fire and water) which they always will have."

In the treatise on *The Seed* sections 5-7.

"When a woman has intercourse, if she is not going to conceive, then it is her practice to expel the sperm produced by both partners whenever she wishes to do so. If however she is going to conceive, the sperm is not expelled, but retained by the womb. For when the womb has received the sperm closes up and retains it, because the moisture causes the womb orifice to contract. Then both what is provided by the man and what is provided by the woman is mixed together. if the woman is experienced in matters of childbirth, and takes when the sperm is retained, she will know the precise day, which she has conceived.

Now here is a further point. What the woman emits is sometimes stronger, and sometimes weaker; and this applies also to what the man emits. In fact both partners alike contain both male and female sperm (the male being stronger than the female must of course originate from a stronger sperm Here is a further point: if (a) both partners produce a strong sperm, then a male is the result, whereas if (b) they produce a weak form, then a female is the result. But if (c) one part produces one kind of sperm, and the other another, then the resultant sex is determined by whichever sperm prevails in quantity.

For suppose that the weaker sperm is much greater in quantity than the stronger sperm then the stronger is overwhelmed and, being mixed with the weak results in a female. If on the contrary the strong sperm is greater in quantity than the weak, and the weak is overwhelmed then it results in a male."

In Section 8 sperm is said to come from the whole body of each parent, weak coming from the weak parts, and strong from the strong parts.

In the treatise on *The Nature of the Child* (section 14, p.326) it is stated that the embryo is nourished by maternal blood, which flows to the foetus and

coagulates, forming the embryonic flesh. Section 15 describes the umbilical as the means by which foetal respiration is carried on.

Section 17 describes the development of the embryo.

As the flesh grows it is formed into distinct members by breath. Each thing in it goes to its similar - the dense to dense, the rare to the rare, and the fluid to the fluid. Each settles in its appropriate place, corresponding to the part from which it came and to which it is akin. I mean that those parts which came from a dense part in the parent body are themselves dense, while those from a fluid part are fluid, and with all the other parts: they all obey the same formula in the process of growth. The bones grow hard as a result of coagulating action of heat; moreover they send out branches like a tree. Both the internal and external parts of the body now become more distinctly articulated. The head begins to project from the shoulders, and the upper and lower arms from the sides. The legs separate from each other, and the sinews spring up around the joints. The mouth opens up**.** The nose and ears project from the flesh and become perforated, while the eyes are filled with a clear fluid[1]. The sex of genitals becomes plain. The entrails too are formed into distinct parts. Moreover, the upper portions of the body now respire through the mouth and nostrils, with the result the belly is inflated and the intestines, inflated from above, cut off respiration through the umbilicus and put an end to it. A passage outside is formed from the belly and intestine through the anus, and another one through the bladder.

18**.** Sections 18 continues that the period of articulation (the period in which the limbs are differentiated)is forty-two days for the female and for a boy thirty days.

By now the foetus is formed. This stage is reached, for the female foetus, in forty-two days at maximum, and for the male, in thirty days at maximum. This is the period for articulation in most cases, take or give a little. And the lochial discharge too after birth is usually completed within forty-two days if the child is a girl. At least this is the longest period, which completes it, but it would still be safe even if it took only twenty-five days. If the child is a boy, the discharge takes thirty days - again the longest period, but there is no danger even if it takes only twenty days. During the latter part of the period the amount which flows is very small. In young women, the discharge takes a smaller number of days; more, when women are older. It is the women who are having their first child who suffer the most pain during the birth and during the subsequent discharge, and those who have had fewer children suffer more than those who have had a greater number."

Section 22 –27 compares the animal embryo with plant seeds, and concludes that from beginning to end the process of growth in plants and in humans is exactly the same.

In Section 30 there is an important passage in which the author discusses the phenomena of birth. and its relation to food.

It concludes, those, which have least food for the foetus, come quickest to birth and vice versa.

1. This has also been translated as **"**'The ears are opened, and the eyes, which are filled with a clear liquid." and compared to the Hadith of the Prophet Mohammad (Allah bless him and give him peace), *'I worship Him Who made my face and formed it, and opened my hearing and eyesight***"**.

However, the translation is in Hippocratic Writings, Penguin Classics, 1983 reads "The nose and ears project from the flesh and become perforated, while the eyes are filled with a clear fluid" .is clearly referring to embryo development, and is totally different to the Hadith of the Prophet (Allah bless him and give him peace). However, the Hadith is talking about something completely different, i.e. acknowledging the bounties of the creator, whist Hippocrates is referring to embryo development..

This example demonstrated the biased and subjective interpretation used by some individuals.

3. Aristotle and embryology

Aristotle (384 – 322 BC) was a Greek philosopher and scientist who wrote over 400 books on many different branches of learning. His main embryological compendium was that entitled *On the Generation of Animals*. Aristotle dissected and examined many different types of animal embryos, mammalian and cold blooded. It is also possible that he dissected an aborted human embryo (Ogle, W. Aristotle on the Parts of Animals, Kegan Paul, London, 1882).

A central part of Aristotle's ideas on embryology was the concept of the menstrual blood coagulating to form the embryo. He regarded menstrual blood as a kind of semen, which required the male semen to initiate development of the embryo by spontaneous generation

"The foregoing discussion will have made it clear that the female, though it does not contribute any semen to generation, yet contributes something, viz., the substance constituting the menstrual fluid (or the corresponding substance in bloodless animals). But the same is apparent if we consider the matter generally, from the theoretical standpoint. Thus: there must be that which generates, and that out of which it generates ; and even if these two be united in one, at any rate they must differ in kind, and in that the essence of each of them is distinct. In those animals in which these two faculties are separate, the body - that is to say the physical nature- of the active partner and of the passive must be different. Thus, if the male is the active partner, the one which originates the movement, and the female *qua* female is the passive one, surely what the female contributes to the semen of the male will be not semen but material. And this is in fact what we find happening; for the natural substance of the menstrual fluid is to be classed as "prime matter." (Aristotle (English trans. A. L. Peck, Heinemann, 1942 edition, Generation of Animals, p.111, 729a).

Aristotle had opened hen's eggs at different stages and describes the order of formation of the embryo;

"How, then, are the other parts formed? Either they are all formed simultaneously - heart, lung, liver, eye, and the rest of them - or successively, as we read in the poems ascribed to Orpheus, where he says that the process by which an animal is formed resembles the knitting of a net. As for simultaneous formation of the parts, our senses tell us plainly that this does not happen: some of the parts are clearly to be seen present in the embryo while others are not. And our failure to see them is not because they are too small; this is certain, because although the lung is larger in size than the heart it makes its appearance later in the original process of formation" (Generation of Animals, p.147, 734a).

Aristotle continues to describes embryonic development by comparing it with the action of rennet and yeast

"The action of the semen of the male in" setting" the female's secretion in the uterus is similar to that rennet upon milk. Rennet is milk which contains vital heat, as semen does, and this integrates the homogeneous substance and makes it "set." As nature of milk and the menstrual fluid is one and the same, the action of the semen upon the substance of the menstrual fluid is the same as that of rennet upon milk. Thus when the " setting " is effected, *i.e.,* when the bulky portion " sets," the fluid portion comes off; and as the earthy portion solidifies membranes form all round its outer surface.

Once the fetation has " set," it behaves like seeds sown in the ground. The first principle (of growth) is present in the seeds themselves too, and as soon as this, which at first was present *potentially,* has become distinct, a shoot and a root are thrown under it, the root being the channel by which nourishment is obtained, for of course the plant needs material for growth. So too in the fetation, in a way all the parts are present *potentially,* but the first principle has made the most headway, and on that account the first to become distinct in *actuality* is the heart" (Generation of Animals, p.191, 739b).

Later on, he also says,

"The reason for this is on a par with the reason why yeast grows. Yeast, like these, is tall in bulk to start with and gets larger : this growth is due to its more solid portion turning fluid, and the fluid turning in to *puenma.* This is the handiwork of the soul-heat. In the case of animals, of the heat of the humour blend with it in the case of the yeast. Eggs thus grow of *necessity* on account of this use *(i.e.,* they contain a yeast-like residue), but also they grow *for the sake* of w*hat is better,* since it is possible for them to obtain all their growth in uterus owing to the prolific habit of these animals." (Generation of Animals, p.305, 755a).

Aristotle describes embryonic growth;

"Beginning at the heart, the blood-vessels extend all over the body. They may be compared to the skeleton models which are traced out on the walls of buildings, since the parts are situated around the blood vessels, because they are formed out of them.

The formation of the uniform parts is effected by the agency of cooling and heat; some things are " set" and solidified by the cold and some by the hot. I have spoken previously elsewhere of the difference between these, and I have stated what sort of things are dissoluble by fluid and by fire, and what sorts are not dissoluble by fluid and cannot be melted by fire. Resuming then: As the nourishment oozes through the blood-vessels and the passages in the several parts (just as water does when it stands in unbaked earthenware), flesh, or its counterpart, is formed: it is the cold which sets " the flesh, and that is why fire dissolves it. As the nourishment wells up, the excessively earthy stuff in it, which contains but little and heat, becomes cooled while the fluid is evaporating together with the hot substance, and is formed into parts that are hard and earthy in appearance, *e.g.,* nails, horns, hoofs and bills; hence, these Nails etc. can be softened, but not one of them can be melted, by fire; though some, *e.g.,* eggshell, can be melted by fluids.

The sinews and bones are formed, as the fluidity solidifies, by the agency of the internal heat; hence bones (like earthenware) cannot be dissolved by fire they have been baked as it were in an oven by the heat present at their formation. This heat, however, to produce flesh or bone, does not work on some casual material in some casual place at some casual time ; material, place and time must be those ordained by Nature: that which is *potentially* will not be brought into being by a motive agent which lacks the appropriate *actuality;* so, equally, that which possesses the *actuality* will not produce the article out of any casual material. No more could a carpenter produce a chest out of anything but wood; and, equally, without the carpenter no chest will be produced out of the wood.

The heat resides in the seminal residue, and the movement and the activity which it possesses are in amount and character correctly proportioned to suit each several part. If they are at all deficient or excessive, to that extent they cause the forming product to be inferior or deformed. The same is true that things that are set " by heat elsewhere than in the uterus ; *e.g.,* things which we boil to make them pleasant for food, or for any other practical purpose.

The only difference is that in this case the correct proportion of heat to suit the movement is supplied by us, whereas in the other, it is supplied by the nature of the generating parent. With those animals that are formed spontaneously the cause responsible 'is the movement and heat of the climatic conditions. Heat and cooling (which is deprivation of heat) are both employed by Nature. Each has the faculty, rounded in *necessity,* of making one thing into this in another thing into that; but in the case of the forming of the embryo it is for a *purpose* that their power of heating and cooling is exerted and that each of the parts is formed, flesh being made soft as flesh. As heating and cooling make it such, partly owing to necessity, partly for a purpose, - sinew solid and elastic, and brittle. Skin is formed as the flesh skin. just as scum or "mother" forms on

boiled liquids. Its formation is due not merely to its being on the outside, but also to the fact that glutinous substance remains on the surface because it cannot evaporate. In blooded animals the glutinous substance is more fatty than in bloodless ones, in which is dry, and on this account the outer parts of the latter are testaceous or crustaceous. In those blooded animal whose nature is not excessively earthy, the fat collects under the protective covering, the skin, seems to indicate that the skin is formed out this sort of glutinous substance, since of course cheese is to some extent glutinous. We are to say, then, as already stated, that all these things are formed partly as a result of *necessity,* partly also not *necessity* but for *a purpose."*

Concurrent growth and differentiation, the former being temporally sequent to the latter, he thus describes :

"Now the upper portion of the body is the first to be marked off in the course of the embryo's formation; the lower portion receives its growth as time goes on (This applies to the blooded animals). In the early stages the parts are all traced out in outline; later they get their various colours and softnesses and hardnesses, for all the world as if a painter were at work on them, the painter being Nature. Painters, as we know, first of all sketch in the figure of the animal in outline, and after that go on to apply the colours.

As the source of the sensations is in the heart, the heart is the first part of the whole animal to be formed; and, on account of the heat of the heart, and to provide a corrective to it, the cold causes the brain to "set," where the blood-vessels terminate above. That is why the regions around the head begin to form immediately after the heart and are than the other parts, the brain being large from the outset" (Generation of Animals, pp.219-225, 743a-743b).

Aristotle also held the belief that males are generated on the left-hand side of the womb, and females on the right hand side (Generation of Animals, 717b).

4. Galen and embryology

Galen (129-199 AD) was a physician and scholar, whose ideas dominated medicine until the Renaissance. Galen’s theory of embryology is to be found in his *On the Natural Faculties*, and *On the Formation of the Foetus*, which deals more with the anatomical aspects.

Galen regarded the living being as owing all its characteristics to an indwelling physis or natural entity with whose "faculties" or powers it was the province of physiology to deal. The living organism was thought to have a kind of artistic creative power, which acts on the things around it by means of the faculties, by the aid of which each part attracts to itself what is useful and good for it, and repels what is not. These faculties, such as the "peptic faculty" in the stomach and the "sphygmic faculty" in the heart, are regarded by Galen as the causes of the specific functions or activity of the part in question.

Galen divides the effects of the faculties into three, genesis, growth and nutrition, and means by the first what we mean by embryogeny.

"Genesis is not a simple activity of Nature, but is compounded of alteration and of shaping. That is to say, in order that bone, nerve, veins and all other tissues may come into existence, the underlying substance from which the animal springs must be altered; and in order that the substance so altered may acquire its appropriate shape and position, its cavities, outgrowths, and attachments, and so forth, it has to undergo a shaping or formative process. One would be justified in calling this substance which undergoes alteration the material of an animal, just as wood is the material of a ship and wax of an image."

Galen then goes on to treat embryogeny in more detail. Galen did not think that menstrual blood played a role in procreation, but concluded that female semen forms the allantoois and the coagulation of male and female semen in the uterus results in the formation of the chorion. He spoke about four stages of development. And he also divided the body into two classes, partes spermaticae and partes sanguineae, a classification which remained in use for several hundred years.

"The seed having been cast into the womb or into the earth - for there is no difference [he says] then after a certain definite period a great number of parts become constituted in the substance which is being generated; these differ as regards moisture, dryness, coldness and warmth, and in all the other qualities which naturally derive therefrom [such as hardness, softness, viscosity, friability, lightness, heaviness, density, rarity, smoothness, roughness, thickness and thinness]. Now nature constructs bone, cartilage, nerve, membrane, ligament, vein and so forth at the first stage of the animal's genesis, employing at this task a faculty which is, in general terms, generative and alterative, and, in more detail, warming, chilling, drying and moistening, or such as spring from the blending of these, for example, the bone-producing, nerve-producing and cartilage-producing, faculties (since for the sake of clearness these terms must be used as well).

Now the peculiar flesh of the liver is of a certain specific kind, also that of the spleen, that of the kidneys and that of the lungs, and that of the heart, so also the proper substance of the brain, stomach, oesophagus, intestines and uterus is a sensible element, of similar parts all through, simple and uncompounded.

... Thus the special alterative faculties in each animal are of the same number as the elementary parts, and further, the activities must necessarily correspond each to one of the special parts, just as each part has its special use. As for the actual substance of the coats of the stomach, intestine and uterus, each of these has been rendered what it is by a special alterative faculty of Nature; while the bringing of these together, the combination therewith of the structures that are inserted into them, etc., have all been determined by a faculty which we call the shaping or formative faculty; this faculty we also state to be artistic-nay, the best and highest art-doing everything for some purpose, so that there is nothing ineffective or superfluous, or capable of being better disposed."

Galen shared many common views with the Hippocratic writers so the book on the formation of the embryo first gives a historical account of the views these writers. Then it goes on to describe the anatomy of allantois, amnios, placenta and membranes.

"I return again to what was postponed from the beginning. This (embryo) draws to itself through the vessels descending to the uterus blood and pneuma, each to its own particular cavity; and, as was said earlier also, along with its own particular cavity ; and as was said earlier also, along with the pneuma that comes through the arteries, it draws in a blood that is finer and warmer than the blood in the veins.

From these it creates tile warmest of the inner organs; and that other thick blood produces for it the form of the liver. And accordingly the many veins that pass through the chorion proceed to (the liver); but the arteries (proceed) to the other organ, the warmer one, which because of a superabundance of heat like a flame does not stop moving but constantly expands and contracts by turns. The veins and arteries that carry matter to these inner organs are as it were their roots; and those that carry (the matter) out to the whole foetus are analogous to trunks that split into many branches. And they too have their generation in the hollowing out of the substance of the semen.

The third of the ruling parts, from which all the nerves grow. has its generation from the semen itself and from it alone. For in the mixing with the female semen many of the bubbles burst, and the pneuma from them passed inside and deep down, in the desire to preserve itself- it was not a kind of vapour but was a self-moving source of the animal and likewise the surrounding fluid of its own accord formed within the semen a cavity filled with pneuma. Then to prevent its being readily emptied out, (the puenma) makes for itself a tightly sealed chamber, pushing back to the outer circumference all that was thicker and harder in the semen’s moist substance surrounding it; and this, when heated and dried, would in time be alone

The power that moulds the animal performs this work at the start; but it is not yet visible at the start because of its small size; when it can first be seen, these are the largest and they lie in order, close to each other and touching, the part that is going to become the source of the nerves, the one that we call the brain being assigned to a higher post; and below it the heart and liver touching each other. As time goes on the three sources mentioned stand further apart and send their offshoots this way and that to the entire body of the animal that is fitted to them, the brain sending out the spinal medulla, a kind of trunk, as it were, the heart the greatest artery, which Aristotle calls the aorta, and the liver the vena cava. And also in the early stages, simultaneously with the generation of these parts, the spine appears around the spinal medulla, hardened in just the way that we described a little earlier; and around the brain, enclosing it on all sides, the cranium appears; and the thorax around the heart, like some spacious yet tightly sealed chamber. At the time of birth this would be not a chamber only, but the first and principal organ of respiration. These parts, then, come into being at some later time.

But let us take the account back again to the first conformation of the animal, and in order to make our account orderly and clear, let us divide the creation of the foetus overall into four periods of time. The first is that in which as is seen both in abortions and in dissection, the form of the semen prevails. At this time, Hippocrates too, the all marvellous, does not yet call the conformation of the animal a foetus; as we heard just now in the case of semen voided in the sixth day, he still calls it semen. But when it has been filled with blood, and heart, brain and liver are still unarticulated and unshaped yet have by now a certain solidarity and considerable size, this is the second period; the substance of the foetus has the form of flesh and no longer the form of semen. Accordingly you would find that Hippocrates too no longer calls such a form semen but, as was said, foetus. The third period follows on this, when, as was said, it is possible to see the three ruling parts clearly and a kind of outline, a silhouette, as it were, of all the other parts. You will see the conformation of the three ruling parts more clearly, that of the parts of the stomach more dimly, and much more still, that of the limbs. Later on they form "twigs", as Hippocrates expressed it, indicating by the term their similarity to branches.

The fourth and final period is at the stage when all the parts in the limbs have been differentiated; and at this part Hippocrates the marvellous no longer calls the foetus an embryo only, but already a child, too when he says that it jerks and moves as an animal now fully formed."

Galen further goes on to describe the embryo as a plant

"But for the present I need not speak of the foetus as an animal, for as a plant it got all its generation and formation from the semen, and right from the start it indicated, as plants do, that the beginning of its motion and formation was two-fold. The downward and underground growth of roots in plants corresponds in the foetus to the growth of the arteries and veins of the chorion to the uterus; and the ascending stalk in plants corresponds to the out growths from the three ruling parts in embryos. Again, just as plants have a two-fold growth from seeds, sending stalk and branches upward as far as the outer most shoots and dividing the root-growth downward, so also the embryos have much-divided outgrowths consisting in arteries and veins that extend as stalks to the whole foetus and as roots to the uterus." (Corpus Medicorum Graecorum: Galeni de Semine: Galen: On Semen (Greek text with English trans. Phillip de Lacy, Akademic Verlag, 1992) section I:9:1-10, pp. 91-95)

Galen taught that the embryo transformed from possessing the life of a plant to that of an animal, and the umbilicus was made the root in the analogy with a plant. The embryo formed firstly, from menstrual blood, and secondly, from blood brought by the umbilical cord, and the way the blood it turns into the embryo is made clearer as follows: "If you cut open the vein of an animal and let the blood flow out into moderately hot water, the formation of a coagulum very like the substance of the liver will be seen to take place." And in effect this viscus, according to Galen, is formed before the heart.

The blood of the embryo was thought to pass from the heart to the lungs and not vice versa. Respiration was thought to occur via the umbilical cord embryo and waste excreted into the allantois. Male foetuses were believed to form quicker than female ones because of the male germs superior heat and dryness. Galen also held the Aristotelian concept which associated male conception with the right side and the female with the left of the womb and intra-uterine movements were said to be felt sooner in the case of the male than in that of the female. Dry foods eaten by the mother, were proposed to lead to a more rapid development of the foetus than other kinds.

5. Embryology in the Jewish scriptures

The Talmud is one of the most important works of Jewish religious literature, which grew up between the second and sixth centuries A..D. The Talmud contains several references to embryology. The embryo is referred to as peri habbetten (fruit of the body), It grew through various definite stages:

(i) golem (formless, rolled-up thing), 0-1.5 months.

(2) shefir meruqqam (embroidered foetus), ~

(3) 'ubbar (something carried), 1.5-4 months.

(4) walad (child), 4-7 months.

5. 5. walad shel qayama (viable child), 7-9 months.
6. 6. ben she-kallu khadashaw (child whose months have been completed)

The ideas of the Talmudic writers on the life led by the embryo in utero are well represented by the remark, "It floateth like a nutshell on the waters and moveth hither and thither at every touch".

Rabbi Simlal lectured: "the babe in its mother's womb is like a rolled-up scroll, with folded arms lying closely pressed together, its elbows resting on its hips, its heels against its buttocks, its head between its knees. Its mouth is closed, its navel open. It eats its mother's food and sips its mother's drink but it doth not excrete for fear of hurting."

It was thought, moreover, that the bones and tendons, the nails, the marrow in the head and the white of the eye, were derived from the father, "who sows the white," but the skin, flesh, blood, hair, and the dark part of the eye from the mother, "who sows the red." This is evidently in direct descent from Aristotle through Galen, and may be compared with the following passage from the latter writer's Commentary on Hippocrates:

"We teach that some parts of the body are formed from the semen and the flesh alone from blood. But because the amount of semen which is injected

into the uterus is small, growth and increment must come for the most part from the blood."

It is possible that the Jews of Alexandria were reading Aristotle in the third century B.C., and incorporating him into the Wisdom Literature, so those of the third century A.D. were reading Galen and incorporating him into the Talmud. God, was thought to contribute the life, the soul, the expression of the face, and the functions of the different parts.

6. Essential Islamic Terminology

Allah:

The name of the One and Only God, the Creator, who is perfect in all characteristics, worthy of worship and who has sent His messengers to mankind.

The Qur'an:

This is the word of Allah revealed to Prophet and Messenger Muhammad (Allah bless him and give him peace) precisely transmitted to us by groups of people from other groups where agreement on falsehood is impossible. It is the miraculous word of Allah and when read, it is considered a form of worship.

The Prophet and Messenger Muhammad (Allah bless him and give him peace):

The last and final Prophet and Messenger born 570 A.D. in Mecca, Allah bestowed him with Prophethood at the age of 40 years.

Al-Hadith:

The tradition of the Prophet and Messenger Muhammad (Allah bless him and give him peace) which consists of his sayings, his practice and acknowledgements.

Meanings of Qur'an and Hadith:

The interpretation of the Qur'an and Hadith has been based on meanings derived from the reference sources included in the references section. The meanings of the important Arabic words have been referenced throughout. The capital letters in the references indicate the sections of the list of references. The number immediately preceding the letter indicates the position of the references within each section. This is followed by page numbers or volume number followed by page numbers as the case may be.

7. Embryo development in the Qur'an

Embryo development in the Qur'an is divided in three main areas. These are as follows:

- • ***Nutfah***: This refers to the beginning of embryonic development and covers the period from the mixing of male and female secretions to the implantation of the zygote into the uterus. During this phase the unicellular zygote continues to divide and assumes a more complex shape.
- • ***Khalaqna*** or ***Takhliq***: This is the second phase of embryonic development, or period of organogenesis. It begins with the third week and ends with the eighth week of pregnancy. It involves further cell division and differentiation into human organs and systems. It is divided into several sub stages ***'Alaqa***, ***Mudgah***, ***Izam*** and ***Lahm***. Each of these terms describes the embryo in a precise and comprehensive manner
- • ***Ansha 'na*** or ***Nash 'ah***: This is the third and final phase of foetal development. Rapid cell division, differentiation, and growth leads to the formation of a definite human shape,

7.1 The beginning of development

This is subdivided as follow:

i). ***Nutfah*** (The drop)

Al-Nutfah in Arabic means a drop or a small part of fluid and ***Nutfah*** in general describes a stage where the beginnings of a human being are found in this fluid (Ref: 6A, 12/6; 17/118; 19/120: 13A, 3/436: 15A, 17/116: 1C, 2/121: 7B, 3/116: 4D, 9/235-6: 5D, 6/258: 4A, 30/234: 7A, 4/336: 10A, 13/9: 12A, 4/288). Its real meaning can only be deduced from the text of Qur'an; evidently it is a comprehensive term and includes male and female gametes and part of their natural environments of fluid. It also includes zygote, morula and blastocyst till implantation in the uterus. This is illustrated by the following citation:

"***was he not a drop or part of germinal fluid (Mani) emitted or programmed***"

(Surah Al- Qiyama, Ayah 37)

Here "***Mani***" means male or female germinal fluid (Ref: 1D, 5/276: 5D, 10/348:2D, 6/2497).

The Prophet's Hadith confirms the fact that the offspring is created from part of the germinal fluids.

"*Not from all the fluid is the offspring created*"

(Sahih. Muslim: Kitab Al-Nekah, Bab Al-Azl)

It is also known that not all parts of the ejaculate are equally potent in the fertilisation process. "In the first portion of the ejaculate are the spermatozoa, epididymal fluids, and the secretions from the Cowper and prostate gland fluids. In the last portions of the ejaculate are the secretions of the seminal vesicles. Most spermatozoa appear in the first part of the ejaculate, which is made primarily of prostatic secretions. Thus spermatozoa in the initial portion of the ejaculate have better motility and survival than those in the later portions, which are chiefly vesicular in origin".

ii) ***Al Maa-ad-Dafiq*** (Gushing, self emitting fluid)

"***Let man think from what he is created. He is created from Al Maa-ad Dafiq***."

(Surah, At-Tariq,86:5-6)

Linguistically, ***Al Maa-ad-Dafiq*** refers to a gushing, or self emitting fluid, or to a drop that is emitted out. In other words, it refers to a discharge that is self emitting, hence motile by itself. The use of microscope has shown that not only sperms, but the ovum also shows motility. The mature sperm is a free swimming actively motile germ cell consisting of a head and a tail. The tail provides motility to the sperm, and helps its transportation to the site of fertilisation.

Fimbrae are finger like projections which are part of the infandibulum, the funnel shaped end of the fallopian tube. The cilia, or the tiny microscopic whips on the fimbrae at the same time help the movement of the ovary to the infundibulum. Unless the sperm and ovum both exhibit movement, fertilisation cannot take place. The Qur'an term "***Al Maa-ad-Dafiq***" thus encompassed the gushing, the self emitting as well as the motile phenomena of this sub-stage.

iii) ***Sulalah Min Ma'a*** (Gentle extraction)

"***Sulalah***" in Arabic means gentle extraction from fluid (Ref: 1D, 3/56-60: 2S, 5/1730: 4D, 11/338: 5D, 7/377). Its meaning in the context used in Qur'an is clear from the following:

"***Then He made his progeny gently extracted "Sulalah Min Ma'a" from lowly fluid***".

(Surah As-Sajdah, Ayah 8)

The fluid refers to both male and female germinal fluids containing gametes and it is now a known scientific fact that both ovum and sperm are gently extracted from their environments.

The ovum is extracted in a long stream of follicular fluid. Similarly one sperm out of millions is drawn out from the seminal fluid.

Further, it is now common knowledge to embryologists that usually only one sperm and one ovum are involved in the normal process of fertilisation. This fact was stated by Prophet Mohammad in the Hadith below:

"*Not from all the fluid is the offspring created*".

(Sahih Muslim, Kitab Al-Nekah, Bab Al-Azl)

iv***) Al-Nutfah Al-Amhsaj***

In Arabic Amshaj means mixture and ***Al-Nutfah Al-Amshaj*** means a mixture of male and female germinal fluids or cells (Ref: 1A, 29/126-7: 2A, 2/195: 6A, 19/121: 7A, 6/418: 8A, 8/393; 9A, 2/454: 4D, 2/367). All Islamic scholars unanimously agree on deriving this meaning from the above expression. This is evidently clear from the following quotation:

"Verily We created Man from mixture of germinal drop"

(Surah Ad-Dahr, Ayah 2)

The interpretation of this Ayah to mean mixing of male and female gametes to form the Zygote***. Al-Nutfah Al-Amhsaj*** is a peculiar combination of ***Nutfah***, which is a noun referring to a single drop and ***Al-Amshaj*** an adjective, which is used in plural form. The grammatical rules of the language permit singular nouns or pronouns to be described by a singular adjective. ***Al-Amhsaj*** is a plural adjective used with the singular noun ***Al-Nutfah***. After mixture of the male and female gametes, the Zygote still remains "***Nutfah***" and in this context the word "Al-***Nutfah Al-Amhsaj***" will mean a combination of many things mixed in a single drop (***Nutfah***) i.e., the maternal and paternal chromosomes with their genetic material and other contents of the Cell. "***Amshaj***" is a plural adjective capable of agreeing with the concept of ***Nutfah*** being a multi-faceted single entity.

v) ***Quarar Makeen*** (A place of settlement firmly fixed)

"Then We placed him a drop (Nutfah) in a place of settlement firmly fixed",

(Surah Al-Mu 'minun, Ayah 13)

The mother's womb or uterus, which is firmly fixed in the body, for settlement of the conceptus is referred to in the Qur'an as "***Quarar Makeen***". There is no proper English equivalent to this expression which could give a complete concept as implied by "***Quarar Makeen***". This expression means settling of the conceptus in the womb and refers to the ideal situation of the latter in the mother's body for formation and growth of a new being. This phrase is comprehensive in its meanings and covers all the known facts and those which are likely to be added later because "***Quarar***" is comprehensive enough to cover any additional information regarding the uterus and "***Makeen***" could cover any future knowledge about the relationship of the uterus to the body :

vi) Three veils of darkness

"He created you in the wombs of your mothers from one stage to another and all along three veils of darkness surrounded you".

(Surah Al-Zumar, Ayah 6)

It is known that the embryo develops within three covers which have been expressed by the Qur'an as "Three veils of darkness". These are taken to mean the following:

a) The abdominal wall,

b) Uterine Wall,

c) The placenta with its choriono-amniotic membranes.

vii) **Results of fertilization**

"He created (Khalaqah) him from "Nutfah" and immediately laid down the plan or programme (Qadarah) of its (future development)".

(Surah 'Abasa, Ayah 19)

a. Creation

Khalaqah in Arabic this means creation of a new being (Ref: 1D, 2/214: 2D, 4/1470: 3D, 157: 4D, 10/87) and aptly explains fusion of male and female gametes to form the Zygote. "this Cell marks the beginning of each of us as a unique individual". Crossing over of chromosomes by relocating segments of maternal and paternal chromosomes, serves to shuffle the genes.

b. Programming (planning)

Qadarah in Arabic means "planned or programmed" and when preceded by the conjunction "FA" indicates a rapidly occurring process. In the ayah given below, "***Faqadarah***" is interpreted to mean that immediately upon formation of the Zygote, the future programming of the new individual is laid down. This is the result of union of male and female pronuclei, which had already undergone shuffle of genes in the process of "cross over" of chromosomes.

c Sex determination

The information about sex determination is beautifully narrated in the Qur'an:

"And He created the two sexes male and female from a drop when ejaculated or planned (Nutfah Idha Tumna) ".

(Surah An-Najm, Ayah 45, 46)

"***Tumna***" in Arabic means "ejaculated" or "planned". "***Nutfah Idha Tumna***" refers to the sperm when the meaning "ejaculation" is applied and can refer to the formation of the Zygote after the union of the sperm and the ovum, when it is taken to mean "planning" (Ref: 1A, 27/44: 2A, 4/32: 3A, 8/83: 5A, 7/117: 13A, 5/116: 19A, 7/711)

Although participation of an X and Y chromosome bearing sperms determines the sex, the new individual cannot be formed without the ovum. Here the second meaning of "***Tumna***" (planned or programmed) can be applied. What we know today with regards to sex determination bears out what was revealed in the Qur'an in the 7th century.

viii) **The conceptus a part of a drop**

"***He created him from (a part of) Nutfah***".

(Surah 'Abasa, Ayah 19)

In spite of the fact that the ***Nutfah Al-Amhsaj*** (fertilised ovum) is a small thing, yet the embryo does not develop from all its components. The inner cell mass contains the cells which later contribute to the formation of the embryonic area from which the embryo actually develops. Only a small portion of cells, derived by repeated division of the Zygote, take part in the formation of the actual embryo, Ayah 19 of Surah 'Abasa accommodates this fact:

"He created him from a part of a drop (Min Nutfah) and then immediately programmed him (his future)".

(Surah 'Abasa, Ayah 19)

"***Min Nutfah***" implies that only a small number of the total cells produced by ***Nutfah*** shall take part in formation of the embryo.

When ***Nutfah*** enlarges, part of it becomes embryonic and the greater part becomes nutritive and protective in function. These groups of cells are derived from a single "***Nutfah***".

This meaning is reinforced by the Hadith:

"*Not from all the fluid is the offspring created and if Allah willed to create a thing, nothing can make Him powerless*".

(Muslim: Kitab Al-Nikah, Bab Al-Azl)

ix) N***uftah Al-Ghayb Al-Ghaydh*** (the key of an embryo's future)

From germinal fluids to implanation

"***Allah knows what every female womb bears and what is penetrating into the womb or decreasing and what is increasing (Al-Ghaydh)*** ".

(Surah Ar-Ra 'ad, Ayah 8)

And Allah's messenger (Prophet Mohammad, Allah bless him and give him peace) said:

"*None knows the future of what is decreasing or penetrating into the wombs except Allah".*

(Sahih Al- Bukhari: Kitab Al- Tafsir)

The above Surah and Hadith can be taken to consider the period of early embryogenesis from insemination to early implantation of the fertilised ovum. The key word in both the Ayah and Hadith is "***Al-Ghaydh***" which could mean:

(1) Passing through or penetration of fluid into depth, like water going into the depth of the earth (1D, 4/405: 2D, 7/202: 3D, 368: 4D, 7/405: 5D, 5/64).

(2) Decrease in amount (Ref: 1D, 4/405: 2S, 7/202: 3D, 368: 4D, 7/405: 5D, 5/64).

The above Ayah and Hadith refer to something which is passing through the female generative system, which is decreasing and or increasing in size and it is something whose future at this stage is known to no one except "Allah". This "something" evidently is a reference to the male and female generative materials and later to the zygote.

When different meanings of the key word, "***Al-Ghaydh***" are applied to the Ayah and Hadith above, these evidently point to the development processes taking place up to the stage of early implantation.

It is scientifically proven that of millions of sperms in the seminal fluid usually only one takes part in the process of fertilisation of the ovum, and only one ovum, out of hundreds of thousands, is extracted from the ovary. So "***Al-Ghaydh***" will mean a decrease in the amount of the Germinal materials used in fertilisation.

When "***Al-Ghaydh***' is taken to mean "passing through", it will cover the period of the journey the ovum takes to reach the uterus and during this period the ovum will be penetrated by the sperm to form the zygote.

It is clear from the above that the word "***Al-Ghaydh***" had been very aptly and correctly selected and we shall not be far from being correct to say that the "***Al-Ghaydh***" stage of development will cover from insemination to early implantation.

The above Hadith says that only "Allah" knows about the future of the conceptus in the stage of "***Al-Ghaydh***". It is quite evident that at an early

stage of development like this, there is no way of knowing about the future of the conceptus. But scientifically, we know that soon after the zygote is formed, the future and identity of the new being has been determined and this is known to Allah only.

There are several steps in determining the identity of a new individual. At the time of ejaculation several million spermatozoa are deposited in the vagina, adjacent to the uterine cervix. This fluid contains several hundred million spermatozoa, most of which are capable of uniting with an ovum to initiate a new life. The total volume of semen is reduced by the passage of some of the spermatozoa into the cervical canal in the direction of a potential ovum. This is the first step after insemination in determining the nature of the future embryo. The female's counterpart in deciding the future embryo's nature occurs when from among the thousands of ova available in the ovaries, only one is passed into the oviduct. This is the second step of the several hundred spermatozoa reaching the ovum only one will penetrate the female gamete’s cytoplasmic membrane and this is a third step in deciding the nature of the future person and it too is covered by the stage of ***Ghaydh***. As a result of fertilisation the dominant and recessive genes possessed by the parental chromosomes establish the new individual's genetic potential.

Through all of these reproductive and development events the future expression of inherited potential is largely decided and though they themselves are generally not directly observable, their effects will become evident to all, later in life. The Hadith says that the key to the embryo's future is decided, at ***Ghaydh.***

According to the Hadith, the keys of the unknown are five which no one knows but Allah, and one of these unknowns is the future of the stage of "***Al-Ghaydh***".

"*The keys of the unknown are five, no one knows them but Allah; no one knows what is in the future except Allah, and no one knows the future of what in the wombs are decreasing or what penetrating into them, except Allah".*

(Sahib Al-Bukhari: Kitab Al- Taf'ir)

From the above ayah it is understood that the relationship of the conceptus with the uterus is in two stages: ***Al-Ghaydh*** and ***Izdiad Al-Rahem***, the preamble of the above Hadith tells us that the key to the future of the conceptus is decided at ***Al-Ghaydh*** and that no one but Allah knows it. The stage of ***Al-Ghaydh*** can be taken to include "***Al-Harth***" or implantation.

x) ***Al-Harth*** (implantation)

It is stated in the Qur'an

"Your wives are as a tilth unto you; so approach your tilth when or how you will".

(Surah Al-Baqarah, Ayah 223)

In the above Ayah is a description which is borne out by present day knowledge of the passage of ***Nutfah***. Its entrance in the mother's genital tract during coitus is similar to the process of ploughing and planting.

The entry of the sperms into the uterus is similar to the planting of seeds in the land. The entry of the sperm into the ovum also carries meanings similar to ploughing and planting. And finally the implantation of the fertilised ovum (***Nutfah-Amshaj***) is also similar to the planting of a seed.

Harth is one word which had conveyed to Islamic scholars centuries ago the meaning and wisdom they had understood (4D, 2/134: 5D, 1/614: 1A, 2/231: 2A, 1/91: 7A, 1/335: 19A, 1/124). These meanings have also been confirmed by modern science in minute detail which the ancient scholars could not understand

7.2 The second phase of embryo development

This is subdivided as follows

i) The ***'Alaqah*** stage

"Then (thumm) We made the drop into an 'Alaqah".

(Surah Al-Mu 'minun, Ayah 14)

In Arabic the word ***'Alaqah*** in fact has several meanings;

- • something which clings or a suspended thing (Ref: 7B, 5/440: 1D, 4/125: 2D, 4/1529: 3D, 343: 4D, 10/267: 5D, 7/20)
- • a leech-like structure (Ref: 9A, 3/242: 20A, 2/281: 7B, 5/139: 2D, 4/1529: 3D, 343: 4D, 10/267)

Amazingly each of these terms can be applied to the developing embryo with stunning precision. All of these terms encompassed by the word ***'Alaqah*** describe the appearance of the embryo as well as its relationship with the womb. From the discussion below it becomes clear that the embryo resembles a primitive multicellular organism which is attached to a host and feeding on its blood.

a) something which clings

Modern science informs us that once the egg has been fertilised in the Fallopian tube it undergoes successive divisions to form a ball like structure of 12-16 cells by the third day. This structure is called a blastocyst and it reaches the uterus in 4 to 5 days. The blastocyst then lies free in the uterine secretions for a further 2 days. About a week after fertilisation the blastocyst begins to attach and implant into the uterine wall. By the 11th to 12th day it is completely embedded in the uterine wall. At this stage chorionic villosities

begin to develop like roots in the soil, these draw nourishment from the uterus necessary for the blastocyst's growth. These formations cover the whole blastocyst and make it literally cling to the uterus. By the end of the second week implantation is complete. Inside the blastocyst the embryo is anchored to the wall of the chorionic cavity by a connecting stalk. Hence, these different ways of clinging and attachment seem to represent the most dominant features from day 7 to 21, and are perfectly described in the Qur'anic description by the word ***'Alaqah***. For greater detail see S. Hussain (1986) 'Al-'Alaq:the mystery explored, Ark Journal, London, pp. 31-36.

b) a suspended thing

The 3 week old embryo inside the blastocyst which is embedded in the uterine wall is seen to be suspended in the chorionic cavity by means of the connecting stalk and is surrounded by the amniotic cavity and the yolk sac. Therefore, the term ***'Alaqah*** accurately describes the suspended embryo after it has been implanted.

c) a leech-like structure

The word ***'Alaqah*** can also be translated as 'leech like structure'. The leech is a elongated pear shaped creature which thrives on blood sucking. At this stage of development the embryo from top view does bear a resemblance to a leech. This resemblance is even more marked if the 24 day old embryo is seen from the side. It is also interesting to note that the embryo is now dependent on the maternal blood for its nutrition and behaves very much like a leech!. (For greater detail see Moore, KL. 'A scientists interpretation of references to embryology in the Qur'an.' Journal of the Islamic Medical Association of US and Canada, 1986, 18:15, and Moore, KL. and Azzindani, AMA.: "The Developing Human, Clinically Orientated Embryology, With Islamic Additions". 3rd Ed., Dar Al-Qiblah and WB Saunders).

In conclusion, whichever of the above terms are used to translate the word ***'Alaqah*** they are all stunningly accurate descriptions of the embryo at this stage in it's development as confirmed by modern science.

There is a gap of a few days between the stages of implantation (***Nutfah***) and *'Alaqah* and this period is clearly explained by the above Ayah:

The word "***Thumm***" in Arabic is a conjunction indicating a time lag and the Ayah will, therefore, mean that after some time we created the "***Nutfah***" into ***'Alaqah.***

ii) ***Al-Mudghah***

External appearance

The Qur'an describes the embryo as evolving into a ***Mudghah***, which means something which has been chewed (especially a piece of meat) or which has the appearance of having been chewed (Ref: 1D, 5/330: 5D, 6/430: 2D,

4/1326). This seemingly crude description is in fact quite accurate: after the fertilised egg lodges itself in the uterus, it begins to receive its first nutrients and energy from its mother. Consequently, it begins to grow especially rapidly, and after a week or two it looks like a ragged piece of meat to the naked eye. This effect is enhanced by the development of small buds and protrusions, which will eventually grow into complete organs and limbs.

At 28 days old the embryo is in the ***Mudghah*** stage. The irregular surface showing somites, resembling teeth prints on a substance, which has been chewed The external appearance of this stage of embryonic development is, therefore, described as something which has no particular fixed features. It is characterised by irregularities on the surface with depressions and bulges. The only fixed feature in a "***Mudghah***" is the mark of a set of teeth. It is suggested that the row of somites which is characteristic of the embryo when it starts to show features of rapid shaping may be likened to the marks of the teeth.

This quick change is described in the Qur'an by using the conjunction "FA" which in Arabic indicates a quick sequence of events.

"Then (fa) we change (khalaq) the leech-like structure into a chewed-like substance (Mudghah)".

(Surah Al-Mu 'minun, Ayah 14)

This transformation is very rapid, so the Qur'an describes this by using the word (***fa***) denoting a quick rather than a delayed change. According to linguistic references, the word ***Mudghah*** has several meanings. The first meaning is "something chewed by teeth". A second meaning is "a small substance". A third meaning is "a small piece of meal like a morsel". Abdullah Yusuf Ali in his commentary of the Holy Qur'an translated ***Mudghah*** as "morsel of flesh"; whereas, Mohammed Asad, Maurice Buccaille and others have chosen a better translation i.e. " a chewed like lump".

Recent studies in embryology have testified the appropriateness of the term ***Mudghah*** for describing the embryonic changes at this stage.

Since the embryo receives its nourishment from the uterus, it goes through a rapid process of growth, as described by the Qur'an term ***fa***. Its cells assume a bead like structure and appear like a substance that has teeth imprints. The embryo later turns its position due to changes in its centre of gravity. This is similar to the turning of a morsel during the act of chewing. All of these changes perfectly corroborate the first meaning of ***Mudghah***.

The embryo at this stage is very small, approximately (1.00) cm in length. it should be noted that the preceding stage of ***Alaqah*** is not equal to the size of a morsel, since it is no more than 3.5 mm in length. This corresponds to the second meaning of ***Mudghah***, in terms of being a small substance. The third meaning of ***Mudghah***,. i.e., as a piece of meal like a morsel, applies again to the size and shape of the embryo at this stage. Hence the Qur'an term

Mudghah is a more precise and comprehensive description of this stage than the term somite which is used by the embryologists. It accurately describes the external form of embryo as well as its stages of internal development. One should recall that these details were not known to mankind even a few years back.

"Then of that leech-like structure we made a chewed-like substance, then we made out of that chewed-like substances a skeleton (bones)"

(Surah Al-Mu 'minun, Ayah 14)

The above Ayah, tells us that the embryo at the stage of ***Mudghah*** does not have flesh in it, because the flesh is stated to come after the bones stage. The other interpretation of ***Mudghah*** as a piece of meat the size of a bite is most likely meant to refer to the shape rather than its size as the Qur'an tends to describe the external appearance of the embryo (only Allah knows best).

At the stage of the "***Mudghah***" other texts use the verbs "***Khalaq***" (creation, formation, initiation). This means that there is an active process of development. Throughout the embryo there is active differentiation in almost every system.

The Qur'an also describes the ***Mudghah*** to be consisting of differentiated and undifferented components.

"Then out of a chewed-like substance partly differentiated and partly undifferentiated (Mokhalaqa wa Ghair Mokhalaqa) ".

(Surah Al-Haj, Ayah 5)

This superb Qur'anic Ayah for an embryo of about 1 cm. gives a description of its internal state by explaining that although the anlage of all organ systems have formed, their function has yet to appear. This is very meaningful in the sense that although there is creation of systems going on, this process is incomplete and the whole thing is just a lump of irregularly shaped tissue chewed-like substance

Thus the Qur'an has given a clear sequence of development by describing the changes of ***'Alaqah*** to ***Mudghah*** and ***Mudghah*** to Skeleton. This sequence is supported by present day Embryology.

iii) ***Jam'a Al-Khalq*** (Compilation - the first forty days)

In an embryo of 40 days which is about 1 cm. long all the main organ systems have their anlage gathered together as mentioned in the Hadith.

*"In every one of you all components of your creation are gathered together by 40 days and in that it is an "**'Alaqah**" like that, then in that it is a "**Mudghah**" like that".*

(Muslim: Kitab Al-Qadar and Bukhari, but without the words "in that)

Jam'a Al-Khalq is a comprehensive word and covers the following:

1. Meeting of the sperm and ovum

2. Meeting of the maternal and paternal chromosomes at fertilisation.

3. Appearance of the anlage of all organs and systems

4. The organs and systems appear collected in a small area i.e. in an embryo of about 1 cm. long.

5. The embryo is curved in "C" shaped manner so that its various parts are nearer to each other.

All the above events happen in the first 40 days.

According to this Hadith when organs and systems have developed during the first 40 days period, the embryo has also passed through the complete "***Alaqah***" and "***Mudghah***" stages during the same period.

The above Hadith, however, had been interpreted to mean that each of the stages took 40 days in Sequence. And some have used this to attack the whole concept of embryo development in the Qur'an. However, these people overlook the fact that there is another Hadith which explicitly states that the stage of creation of the specific differentiated organs start after the first 42 days.

"When forty-two nights have passed over the "drops" Allah sends an angel to it' who shapes it and makes its ears, eyes, skin, flesh and bones. Then he says, 0! Lord, is it male or female? and your Lord decides and the angel records it".

(Muslim: Kitab Al- Qadar)

This Hadith indicates that the ***Nutfah***, 'Alaqah and ***Mudghah*** stages are completed before 42 days. Further, the bones stage which follows the ***Mudghah*** (Ayah 14, Al-Mu'minun) is now stated to occur after 42 days according to this Hadith. If the interpretation of the first Hadith is correct this will mean that the bones appear after 120 days. The Hadith used the phrase "like that" which can be interpreted as a repetition of the time period or as a repetition of the completion of form in each of the stages of ***'Alaqah*** and ***Mudghah***. Thus the phrase is "Mujmal" general; but in the second Hadith it is explicitly (Mubayyan) stated that the bones start to differentiate after 42 days. The rule followed by Muslim scholars Interprets the "Mujmal" in the light of "Mubayyan" which clarifies the generalisation and gives the specific meaning and intention of the speaker.

As early as *651* A.H. Ibn Azzamlakani had reached the conclusion that the stages of 'Alaqah and ***Mudghah*** were completed during the first forty days:

Ibn Azzamlakani states: *"Then he becomes 'Alaqah like that"* meaning that in the 40 days mentioned the conceptus will be ***'Alaqah*** which is completely and perfectly formed within the perfection which is possible for it. Thus they are equal in completion in its generality and not in particularities. "Then he becomes ***Mudghah*** like that" i.e. in its own share of the 40days also completely formed as the complete human being is perfectly formed. In Arabic usage, it can be said that a man changes during his life and this can be explained by saying: then be becomes an infant, then he is weaned, then he is a child, then he is a youth, then he becomes middle aged, then he becomes an old man, then HE, ALLAH, decides that he dies after that".

iv) ***Izam*** (bones stage)

The seventh week

The Qur'an uses specific terms to describe different stages. It is observed that the shape of the embryo determines the selection of the term used for each stage, e.g. the ***Nutfah*** changes to ***'Alaqah*** when it loses its drop-like appearance. Similarly the ***'Alaqah*** changes to ***Mudghah*** according to the change in shape.

It is mentioned in the Qur'an:

"Then we made out of that chewed-like substance bones"

(Surah Al-Mu 'minun, Ayah 14)

Accordingly the stage which follows the ***Mudghah*** stage will be called the bones (***Izam***) stage for the same reason.

The anlage of the skeleton which formed in the embryo during the "***Mudghah*** stage" (between 25-40 days) transforms into cartilaginous models indicating the shape of future bones. Thus, the shape of the embryo changes from "***Mudghah*** shape" to one determined by the form of the skeleton. The embryo is now in the Bones (***Izam***) stage.

In the bones stage, various organs take up new positions in relation to the growth of the skeleton. This stage is of special significance in that it gives the embryo human features.

v) **The formation of bones**

"When 42 nights have passed over the **Nutfah***, Allah sends an angel to it, who shapes it and makes its ears, eyes, skin, flesh and ~*

(Sahih Muslim: Kitab Al- Qadar)

The reason for calling it the bones stage is that at this time spreading of the skeleton starts, giving the body its human shape. This skeleton, however, is made of a soft substance at this stage (cartilage) which eventually changes to another creation during the stage ***of Al-Nash'ah.***

The Qur'an also points out the nature of this advancement in the developmental process (change in the creation) of the embryo which becomes another creation physically and spiritually.

*"In every one of you all components of your creation are gathered together by 40 days and in that it is an "'**Alaqah**" like that, then in that it is a "**Mudghah**" like that".*

(Muslim:Kitab Al- Qadar and Bukhari, but without the word "in that")

According to this Hadith the bones are among the parts of the creation which are gathered together during the first 40 days. According to the modern embryological descriptions all the systems of the body are represented by primordia during the first 6 weeks when the embryo is 1 cm long. These organs, however, do not have the forms we are familiar with. This is also true of the bones at this stage. They are being formed but have not yet taken the shapes and forms of the bones we know.

"And then we changed the leech-like structure into a Mudghah (chewed-like substance) then we made out of that Mudghah bones (skeleton)".

(Surab Al-Mu 'minun, Ayah 14)

This Ayah tells us that the bones follow the ***Mudghah*** stage. As explained above the ***Mudghah*** stage ends by about 40 days. Thus the bones stage comes after the first 40 days.

vi) ***Al-Kisa'a Bil-Lahm*** (clothing with flesh stage of, muscles)

"Then We clothed the bones with flesh"

(Surah Al-Mu 'minun, Ayah 14)

The above Ayah explicitly states that the bones are formed first and that this is followed by the formation of flesh or muscles which take their position around the bones (clothing the bones). In fact the primordia or precursors of both the bone and muscle (in the form of myotomes and selertomes(are present together with those of bones and other tissues and organs in a collective primitive structure are formed during the first 40 days and is found in the ***Mudghah***. However, in this stage the primordia of muscle have not yet differentiated into definitive bones and muscles. As they do not have the shapes or forms of bones or muscles, the whole embryo at this stage does not have a human appearance.

During the seventh week- the skeleton begins to spread throughout the body and the bones take their familiar shapes. The embryo then starts to acquire the human appearance. At the end of the seventh week and during the eighth week the muscles take their positions around the bone forms, "definitive muscles of trunk, limbs and head are well represented and foetus is capable of some movement".

With the completion of this stage "***Alkisa'a Billahm***" at the end of the eighth week the embryo becomes a foetus and thus the stage of ***Nash'ah*** begins as stated by the remainder of the above Ayah.

"Then We clothed the bones with flesh; then We developed out of him another creature. So blessed be Allah, the best to create".

(Surah Al-Mu 'minun, Ayah 14)

The Qur'anic Ayah tells us that: clothing with flesh follows upon the bones stage. It has been explained previously that the terms used to describe various stages of development are derived from the feature which dominates and determines the shape of the embryo or foetus during that stage e.g. the shape of the skeleton determines the general appearance of the embryo in the bones stage during the 7th week; muscles do not develop at the same time but their development follows soon after. The muscles take their positions around the bones throughout the body and therefore Clothe the bones. Thus, the muscles take their well known forms and structures. This is referred to in the Qur'an:

"Then We made of that Mudghah bones (skeleton) then We clothed the bones with flesh (muscles)..."

(Surah Al-Mu 'minun, Ayah 14)

At the "Clothing with Muscles Stage" the embryo acquires human features and starts to become more straight. The external genital organs start to become differentiated.

The Qur'an has placed the stage of clothing with muscle to mark the end of embryonic stage; the foetal stage (***Nash'ah***) follows, as explained in the Ayah:

"Then We made of that Mudghah bones (skeleton) then We clotted the bones with flesh (muscles) then We developed out of him another creation, so blessed be Allah the best to create".

(Surah Al-Mu-minun, Ayah 14)

The stage of clothing with muscle occurs during the 8th week which is the end of the embryonic stage after which it goes to another stage with other features, the foetal stage or "***Al-Nash'ah***".

vii) After the 42nd day

The developmental events after 42 days are described in the Hadith:

"When forty two nights have passed over the Nutfah, Allah sends an angel to it, who shapes it and makes its ears, eyes, skin, flesh and bones. Then he says "0 Lord! Is it male or female?" And your Lord decides what He wishes and then the angel records it".

(Muslim: Kitab Al- Qadar)

By the beginning of the seventh week of development the embryo has acquired a skeleton, mostly cartilaginous, which gives form to the body of the embryo and recognisable human characteristics. After the 42nd day, the limb buds are longer with differentiated fingers and toes. The tail bud; which was previously conspicuous, has regressed almost completely.

The eyes migrate from the sides to their definitive position and the primordia of the face merge to confer human features. The anlage of the eye and ears make their appearance before the seventh week, but they do not have a human appearance as yet. After the 24th week, the foetus can hear sound, and by the 28th week, the retina becomes sensitive to light. External, middle and internal parts of the ear are formed after the 42nd day and then acquire its function and recognisable human shape.

The skeletal system, muscles and skin are fully developed and with recognisable human characteristics after the 42nd day. The skin is differentiated into epidermis and hypodermis, more characteristic of the adult by 12 weeks.

During the 4th week the anlage of the external genitalia appear and not until the 9th week do they start to show any distinguishing sexual characteristics. The male foetus can be clearly distinguished from the female only by the 12th week.

According to the Hadith, while all other organs and systems are well formed and have acquired human characters, the morphological appearance of the external genitalia (by which sex can be identified with the naked eye) is not distinct enough to permit sexual identification. The Angel asking about the sex is a reference to this fact.

7.3 The foetal period

i) ***Al-Nash'ah*** (another development)

"We then placed him as a drop (Nutfah) in a place of settlement firmly fixed". Then We made the drop into an 'Alaqah (leech-like). And then We changed the leech-like structure into a Mudghah (chewed-like structure), then We made out of that Mudghah bones (skeleton, Izam). Then We clothed the bones with flesh (muscles, Lahm). Then We developed (ansha'a) out of him another creation."

(Surah Al-Mu 'minun, Ayah 13-14)

At the end of the 8th week clothing with muscle occurs (***Al-Kisa Bil-Lahm***) and before the 12th week there is a period of slow growth and development. By the twelfth week there are important developments as well as the beginning of notable changes in the size of the foetus.. The most obvious difference with the embryonic period is that the foetus has acquired definite signs of human appearance

The verb "***ansha'a***" carries two meanings (a) to initiate and (b) to cause to develop (1D, 5/428: 2D, 1/77: 4D, 1/170: 5D, 1/126); both of these meanings apply to the foetal period.

New developments pertaining to the first of these meanings are given by the following extract from Persuad and Azzindani (1983):

"At twelve weeks gestation, centres of ossification are present in most bones. The limbs are differentiating and nails can be detected on the fingers and toes. Lanugo hair is present on the skin, which is now fully differentiated into epidermis and hypodermis. The testes have begun their descent and the internal genitalia (uterus, fallopian tubes, vagina) are developing. At this stage, a male foetus can be distinguished from a female on the basis of the external genital organs. Voluntary and smooth musculature are established. Foetuses at this stage of development reveal spontaneous movements, and reflex muscular contractions can be elicited by an external stimulus".

Other developments, pertaining to the second meaning, are the general growth of body and various organs in size as well as the structural nature of the tissues. The distinction of the external genitalia by inspection can also be made at about the 12 th week.

Many Muslim scholars believe that soon after the embryonic period which ends by the clothing of bones with flesh, the 'soul' comes into the conceptus.

ii) **Period of *Nash'ah***

Let us consider the following Ayah:

"Who (Allah) created you, made you even and straight (Sawwak) and then modified (Addalak) you. !n whatever form (facial features) He wanted. He put you together".

(Surah Al-Infitar, Ayah 7,8)

"***Sawwak***" means to make even and straight (2A, 4/228: 4A, 31/80: 2B, 2/666: 1C, 3/79: 1D, 3/113: 2D, 6/2384-6: 4D, 14/408: 5D, 10/189) The pluripotent cells of the embryo begin to follow various lines of differentiation and modify into different functional moieties. This process is essential for straightening and the formation of organs essential for viability. Also at this stage body surface is becoming more even and its configuration is straighter

"***Addalak***" in Arabic has many meanings; but in this context it means modifying in form and shape to create a definitive thing. Changes can be taken to indicate the concept of the word "***Addalak***" as used in The Qur'an (1D, 4/246-7: 5D, 8/209).

"***Fa' Addalak***" as stated above shall be taken to mean "then immediately modified your form" since "'Addalak" is qualifying the latter part of the Ayah which means that Allah constructed you in any shape He liked, this is done, of course by modifications.

A group of Muslim scholars interpreted this Ayah by considering that "***Addalak***" is linguistically placed to explain what comes after it i.e., the acquisition of human features.

iii) ***Al-Qabliyah lil Hayah*** (viability)

There is no sharp limit beyond which survival of the foetus is assured but experience has shown that a foetus whose fertilisation age is less than 22 weeks, rarely survives. Considering the two "Ayah" below, this can be taken to mean that the foetus becomes viable at about 6 months.

"The duration of pregnancy and separation is thirty months".

(Surah Al-Ahqaf, Ayah 15)

"His separation is at the end of two years".

(Surah Luqman, Ayah 14)

Thus the total period of breastfeeding plus the period of pregnancy is stated as thirty months. It is also stated that for two years the child is fed on the mother's breast at the end of which he is weaned. The two texts taken together leave only 6 months (22 weeks i.e., five and half Gregorian months are equal to about six lunar months. of pregnancy). This is about the same period, which has been established for viability.

This interpretation was derived by Ali Ibn Ali Talib (may Allah be pleased with him) from the above two Ayahs and another Ayah:

"Mothers shall breast feed their offspring for two whole years, for those who want to complete the breast feeding".

(Surah Al-Baqarah, Ayah 233)

This interpretation was also agreed to by Khalifa Othman (may Allah be pleased with him) and a group of the Prophet's companions.

iv) ***Al-Hadanah Al-Rahemiah*** (Uterine support)

"The duration of pregnancy and separation is thirty months"

(Surah Al-Ah qaf Ayah iS)

"His separation is at the end of two years

(Surah Luqman, Ayah 14).

From the comparison of the two "Ayah" we learn that the duration of pregnancy is 6 months, but it is a common knowledge that the duration of pregnancy is 9 months. How then do we account for the shortage of 3 months in the account given by the Qur'an?

The explanation is that the real period of pregnancy is 6 months, during which the foetus is essentially dependent on his mother for its survival. However, if born immature at the end of a minimum of 6 months of pregnancy, the child can survive outside the body of the mother with outside support. Thus the last 3 months not accounted for, in fact correspond to this period of possible survival outside the mother's body.

iv) ***Izdiad Al-Rahem*** (Increase in size of the uterus)

"Allah knows what every female bears and what is penetrating and decreasing in the womb and what is increasing*"*

(Surah Al-Ra 'd, Ayah 8)

When ***Al-Ghaydh*** stage of the ***Nutfah*** (which may be taken to include the process of implantation) is completed the embryo establishes contact with the mother's circulation and thus receives the required amounts of nutrients, which are necessary for its development. A rapid stage of development follows and the size of the uterus then begins to increase (***Izdiad Al-Rahem).***

If we refer to the stage of ***Al-Ghaydh*** we note that the key to the embryo's future is decided at this stage and no one knows this but Allah. One of these aspects is the sex of the embryo.

We understand from the interpretation of Al-Bukhari of Surah Al-ra'd that the key to the future of the embryo lies in the stage of ***Al-Ghaydh***. On the other hand the following Ayah informs us that the conceptus passes through two stages:

a) The stage of ***Al-Ghaydh***: This includes the key to the future according to Al-Bukhari an (told by Abdullah Ibn Omar, may Allah be pleased with both). and also no one knows what is in the wombs, of what Allah wants to create, except Allah, Glory be to Him; but if Allah willed it to be male or female, unhappy or happy, He informed the Angels who are concerned with that and those He wished to inform of His creatures".

b) The stage of ***Izdiad***: This is outside the aspects, which are part of the key to the embryo's future, as concluded from the above Ayah. Therefore***, Izdiad***

Al-Rahem is a stage open to human knowledge as it lies outside the keys to the future, which only Allah knows.

The Hadith tells us on many occasions that Angels after the first 40 days know many things about the embryo's future e.g. sex, happiness etc. This can be taken to indicate that it is also possible for man and others to know something about the embryo's future. This is possible in the stage of ***Izdiad Al-Rahem*** which, as explained above, lies outside the keys of the future which only Allah knows. This conclusion was drawn by Ibn Kathir (vol. 3, pp *454-6).*

v) ***Tayseer Assabil*** (making the passage easy)

"Parturition, or labour"

"Then we made the passage (through the birth canal) easy".

(Surah 'Abasa, Ayah 20)

Birth is a dangerous time for many women and the birth canal appears to be a difficult passage for the baby. Normally the vagina can only admit 3-4 fingers, while the cervix uteri is so tightly closed that even the little finger cannot be admitted into it. These tight passages are surrounded by a rigid ring of bony pelvis.

"Allah" says that He made the passage (through the birth canal) easy. We now know on the basis of the following scientific discoveries as to how this passage is opened up to allow birth to take place. This is what the Qur'an is referring to by using the general tern "easy".

a) Relaxing: A hormone secreted by the ovaries and placenta, loosens the ligaments of the pelvic joints, and softens the cervix.

b) Bag of Water: With each uterine contraction the membranes filled with amniotic fluid bulge as a bag of water through the cervix uteri and facilitate its dilatation. After rupture of the water, the membranes provide a smooth slippery surface for the foetus to glide down.

c) Mechanism of Labour: A series of changes in the attitude and position of the foetus facilitate its passage through the irregularly shaped pelvic cavity. As an example these changes for the occiput position are descent, flexion, internal rotation, extension, restitution and external rotation.

All the above mentioned factors contribute in various ways to make the passage of the foetus through the birth canal easy.

7.4. Miscellaneous topics

i) **Dominant and recessive characters in the light of the hadith**

It is well known that inherited characteristics can be dominant and therefore appear in the offspring immediately, but may be recessive and therefore can remain dormant and appear in future generations.

We shall consider two texts from The Hadith. The first of these is concerned with dominant characteristics and the other with recessive characteristics.

a) **Dominant characteristics**

"0, Allah make us enjoy our hearing, our vision and our strengths as long as you make us live and make that our inheritor". (Al-Tirmidhi and Al-Hakim in Al-mustadrak)

The use of the word "inheritor" rather than inherited is meaningful. It is obvious that the characteristics are inherited. In the above Hadith it is placed grammatically as a subject rather than an object. It is impossible for the characteristics to inherit us during our life time (as understood by some Muslim scholars). The first part of the Hadith teaches us to request from Allah that we enjoy them during the whole of our life time. Further more, heredity by definition occurs between parents and offspring.

This understanding by some Muslim scholars was due to the fact that "inheritor" is never used to describe what is inherited by children from parents in which case the word "inherited" is used. The deviation from this rule in the Hadith by using "inheritor" (*Al-Warith*) must have a special meaning.

The answer to this lies in recent discoveries on the role of dominant genes, which exert a controlling influence in heredity and therefore cause the recessive genetic characteristics not to appear in the offspring.

Thus the request for inheritance of the characteristics mentioned in the Hadith is in the subject *form (Al-Warith*) i.e. dominant rather than the object i.e. passive or recessive.

b) **Recessive characteristics**

Abu-Huraira narrated: A man came to the Prophet Mohammad (Allah bless him and give him peace), and said:

"0 Allah's prophet, A black child has been born for me"! The Prophet asked him, "Have you got camels?" The man said, "Yes". The Prophet asked him, "What colour are they?" The man replied, "Red". The Prophet said, " Is there a grey one among them?" The man replied, "Yes". The Prophet said, "Whence comes that?" He said, "May be it (colour) was pulled out by a hidden trail". The Prophet said, "May be your son's (colour) was also pulled out (by a trait)"

(Al- Bukhari: Kitab At- Talaq, Bab Idha Arrada Benafi Al- Walad, (by a trait) in the answer of the Prophet was included in Bakhari, Kitab al-Hudood)

The first Hadith dealt with dominant characteristics and this one deals with Recessive genetic characteristics. It must be remembered that this was revealed to the Prophet some one thousand and four hundred years ago.

Two conclusions can be drawn from this Hadith. First, the deduction by the Prophet of similarity of heredity laws in man with those in animals. Second, that a characteristic which becomes hidden (recessive) for several generations may appear again in the future. This is in complete agreement with the present knowledge of the laws of heredity.

In summary this incident tells us that the Prophet (Allah bless him and give him peace) has clarified to the man an aspect of heredity which was unknown to him. This was achieved by inducing the conclusion from the man's own environment which was welt understood by him. The Prophet then accepted his conclusions.

ii) **The critical period**

When forty-two nights have passed over the conceptus, Allah sends an angel to it, who shapes it shapes it, makes its ears, eyes, skin, flesh and bones. Then he says 0 Lord! is it male or female ? And your Lord decides what He wishes and then the angel records it". (Muslim - Kitab Al- Qadar)

This is a remarkable Hadith which gives a wonderful description about the period of conception when different organs and tissues are taking shape on account of various chemicals like: inducers, organisers, hormones, enzymes, etc. This is about the same time when the Hadith says that an angel comes and begins to model a new being. The remarkable point about the Hadith is that it precisely records the time when these organs are differentiating and can be influenced by external factors.

iii) **Gross congenital deformities**

We do not see many deformed babies in real life. The majority of grossly malformed embryos and foetuses never come to term. Even if they are born and survive they can not reproduce. It is stated in the Hadith:

"Allah never gives offspring to a monster nor does He give him grandchildren".

(Sahih Muslim: Kitab Al- Qadar)

The genetic sex established at fertilisation does not always result in clear-cut male or female appearance of the external genitalia. Errors in sex development occur about once in every 1000 foetuses which result in various degrees of intermediate sex, a condition known as inter-sexuality. These sexually abnormal individuals cannot reproduce because their reproductive organs have not developed normally and as a result they are non-functional.

The word "monster" in the translation is used to indicate the condition in which the child is grossly malformed due to congenital abnormalities. Gross malformations usually affect the central nervous system and the endocrine system both of which are essential for normal reproduction.

It can also be concluded from the Hadith that this general statement applies to animals as well as man, because it was made on an occasion when an animal was mentioned.

Congenital deformities can also result from infective agents: sexual promiscuity has long been associated with syphilis and gonorrhoea. Because of sexual permissiveness, there is an alarming increase of relatively new and more severe venereal infections for which there is no cure at the present time. These include genital herpes and Acquired Immune deficiency Syndrome (AIDS) which are gradually reaching epidemic proportions. It is appropriate to quote the Hadith on this topic:

"Whenever sexual permissiveness spreads among the people until it becomes declared, infections and killing disease as well as illnesses not previously found in their ancestors will also spread among them

(Related by Ibn Majah, Al-Bazzar and Al- flaihaqi)

Also sexual promiscuity may lead to cervical dysplasia, with the risk of malignancy. The development of these pathological changes is related to the frequency of sexual intercourse and the number of partners. Fourteen hundred years ago, Allah in His infinite wisdom and mercy had already admonished us of the consequences and dangers of promiscuous sexual relationships.

iv) **Construction of facial features**

"The development of the face"

The face is not just a single organ or structure but it is constructed from five primordia The face is the most important component of the general appearance of an individual by which he can be identified. The following Ayah refers to construction of the appearance or shape of the individual.

"In whatever form (facial features) He wanted He put you together".

(Surah Al-Infitar, Ayah 8)

The word "Surah" is used in this text. In the Prophet's Hadith and general Arabic usage (Surah) is used to indicate the facial features. Thus the Ayah can be interpreted to refer to the appearance of the individual in general and to the construction of the face in particular.

The face begins to take human features after 42 days by formation of bones. These features become clearer with the formation of ears, eyes, muscles and

skin. These developmental events are collectively mentioned in the Hadith which states:

*"When forty-two nights have passed over the **Nutfah**, Allah sends an angel to it, who shapes it (makes its face) and makes its ears, eyes, skin, flesh and skeleton. Then he says, "0 Lord! Is it male of female?" And your Lord decides what He wishes and the angel records it".*

(Muslim: Kitab Al- Qadar)

The word Surah has also been used in the Hadith. It is obvious that before 42 days all the anlage of the structures mentioned in the Hadith were present, though morphologically not recognisable as human organs.

v) **Human sex development - the genital system**

There are three statements in the Qur'an and Hadith regarding the stages of sex development.

The first is:

"And that he did create the two sexes, the male and female from Nutfah as it is emitted or planned".

(Surah An-Najm, Ayah 45,46)

Primarily sex determination occurs at fertilisation and depends upon the type of the sex chromosome in the sperm which fertilises an ovum. An X-bearing sperm results in the formation of a female individual, whereas, a "(Y-bearing sperm results in the formation of a male individual. Hence, primary sex determination is controlled by the sex chromosomes and the genes carried by them. This is in agreement with the Ayah from the Qur'an which states that either a mate or a female will be created from the ***Nutfah***.

The above Ayah is taken as reference to genetic sex determination.

The second is:

"Then did he become a leech like structure then did Allah make (him). Then fashioned (straightened or smoothened him). Then of him made two sexes, male and female".

(Surah Al- Qiyamah, Ayah 38,39)

No morphological indication of sex is visible until the seventh week, when the testes or ovaries begin to form. The development of the external genitalia begins during the early foetal period. This agrees with the Qur'an that sex development begins after the bone and muscles form, as is clear from the comparison of the following two Qur'anic texts

1)

"Then We placed him as a drop (Nutfah) in a place of settlement firmly fixed".

"Then We made the drop into a leech-like structure ('Alaqah)".

"Then We changed the leech-like structure into a chewed-like substance (Mudghah)".

"Then We chewed-like (skeleton)".made out of that substance bones

Then We clothed the bones with flesh (muscles)".

(Surah Al-Mu 'minun, Ayah 13,14)

2)

"Was he not a drop from germinal fluid"?

"Then did he become a leech-like structure"?

"Then did Allah make (him)"?

"Then fashioned (straightened or made even)".

"Then of him He made the two sexes male and female".

(Surah Al- Qiyamah, Ayah 37-39)

By comparison of the above texts from the Qur'an it is found that there is a consistent description of the stages of development from the ***Nutfah*** to the ***Nash'ah*** stage. It is concluded that sex differentiation (development of the gonads) occurs during the stage of clothing with flesh as shown in the above table.

The third is the following Hadith:

"When forty-two nights have passed over the ***Nutfah****, Allah sends an angel to it, who shapes it and makes its ears, eyes, skin, flesh and bones. Then he says, "0 Lord! Is it male of female?" And your Lord decides what He wished and then the angel records it".*

(Sahib Muslim: Kitab Al- Qadar)

The genitalia are similar in both sexes until the ninth week; thereafter sexual characteristics begin to develop. Development of the external genitalia is not complete until the twelfth week, by which time the models of the bones have formed and the muscles have become attached to them which agrees with the above Hadith. The three texts above talk of sex development and they were

revealed a long time ago, before modern Science discovered the known facts on this subject. They could have been understood to contradict each other before the facts were discovered. However, the knowledge of Allah is the ultimate wisdom. Therefore, when man comes to discover the facts, he finds out that they are completely in agreement with what has been revealed in the Qur'an and the Hadith.

8.Qura'nic Embryological terms summary

The following terms have been taken from Qur'an. The relevant references are quoted in the text above. The terminology is based on easily understood actions and changes in the shape of the conceptus. See the text of this paper for more details.

The following table summarises embryo development by using verses from three different Surahs.

TABLE 1: Summary of Qur'anic terms

Stages	**Surah Al-Intifar 7,8**	**Surah Al-Qiyamah 37-39**	**Surah Al-Muminun 13-14**
Nutfah		Was he not a drop or part of germinal fluid emitted or programmed	We then (*thumma*) placed him as a drop (*Nutfah*) in a place of settlement firmly fixed
'Alaqah		Then (*thumma*) he became *'Alaqah* (leech-like)	Then (*thumma*) we made the drop into *'Alaqah* (leech-like)
Mudghah	Who (Allah) created you	And (*fa*) did Allah make (create) him.	And then (*fa*) we changed (created) the leech-like structure into a *Mudghah* (chewed like substance)
Izam	Made you even and straight	And (*fa*) then fashioned (straightened and smoothed) him…..	Then (*fa*) We made out of that *Mudghah* bones (skeleton) Izam
Lahm	…And modified you. In whatever form (facial features) He wanted He put you together	….Then (*fa*) of him He made the two sexes male and female	Then (*fa*) we clothed the bones with flesh (muscles, *Lahm*)
Nash'ah			Then (*thumma*) we developed out of him another creation

EXPLANATORY NOTES ON TABLE 1:

(I) The congruent use of the two conjunctions, (thumma and fa) : "Thumma" which indicates a slow sequence, is used in Al-Mu'minun and Al-Qiyamah between *Nutfah* and *'Alaqah* "Fa", which indicates order and rapid succession, is used in the other stages of the embryo mentioned in the above two surahs.

Thus the order and rate of development is similar in the two surahs.

(2) The first and second stages (*Nutfah* and *'Alaqah*) : These two stages are congruent in Al-Mu'minun and Al-Qiyamah and the conjunction "thumma" has been used in both. No mention of these two stages is made in Al-Infitar.

(3) The third stage (*Mudghah*) "*Mudghah*" (a noun) was used in Al-Mu'minun to describe the stage which follows the "'Alaqah". This noun is indicative of the shape. In "Al-Qiyamah" text, the verb *"Khalaqa*" has been used. This verb indicates the events which take place in "*Mudghah*" stage. "*Khalaqa*" is thus taken to correspond to the beginning of the development of the various organs during the "*Mudghah*' stage.

As the outer appearance of the embryo alters with the changes taking place inside it, then the verb "*sawwa*" in "Al-Qiyamah" is taken to indicate that the "*Mudghah*" stage is over. The "*Mudghah*" has no bones or muscles and therefore does not have the human shape.

Thus the stage of straightening and making the surface of the embryo more even mentioned in "Al-Qiyamah" must therefore, come after "*Mudghah*" stage. The order of events in "Al-Mu'minun" and "Al-Qiyamah is the same. Thus it is taken that the straightening in "Al-Oiyamah" follows immediately after the "*Mudghah*" i.e. corresponding to the bones "*Izam*" stage in "Al-Mu'minun

"*Mudghah*" has been described by the verb "*Khalaqa*" in "Al-Qiyamah" describing the events which take place in it. Thus the process of creation is a particular feature of the "*Mudghah*" while terms like *Nutfah* and 'Alaqah have been used in the previous stages. In "Surah Al-Haj" the "*Mudghah*" is again described as formed and unformed. This indicates that the process of formation and initiation of various organs is a prominent characteristic of this stage.

Furthermore, by comparing the texts in "Al-Qiyamah" and "Al-Infitar", we find that "*Khalq*" and straightening are in congruent sequence in both texts. This also indicates that "Al-Infitar" text has also started with the *Mudghah* stage by using the verb "Khalaqa" which is an important characteristic of this stage as explained in the above paragraph.

(4) The fourth stage: As explained in the third stage the beginning of the bones '*Izam*" stage corresponds to the stage of straightening, Furthermore, Al-Infitar shows that the stage of straightening does not include modification "Ta'dil" as this is stated to follow upon; straightening. Modification occurs by approaching the human appearance which cannot occur at the stage of bones without the presence of the muscle. It can therefore be concluded that the modification stage starts with the beginning of the clothing with flesh (muscle) stage i.e. it follows the stage of the bones which corresponds to the straightening stage. This is indicated by the order of events stated in "Al-Mu'minun" on one hand and both "Al-Qiyamah" and 'Al-Infitar" on the other. The Qur'an has therefore used the noun 'bones' to indicate shape in the first instance and a verb "*sawwa*" in both the latter surahs to describe an event. The embryo at this stage becomes more straight after having been bent (C-shape) and its surface more smooth after having been uneven during the "*Mudghah*" stage.

(5) The fifth stage: In the above discourse it has been mentioned that the beginning of the stage, clothing with flesh, corresponds to the beginning of the modification stage in "Al-Infitar". This latter stage must correspond to the statement:

"and We made from it the male and female" in "Al-Qiyamah" because both are preceded by the straightening stage. Therefore, the beginning of male and female differentiation corresponds to the stage of clothing with flesh in Al-Mu'minun. This is in fact what actually takes place. There is differentiation of the genital ridge into either an ovary or a testis at this stage.

(6) The sixth stage and the continuation of the fifth: In surah Al-Mu'minun the conjunction "thumma" was used between the stage of clothing with flesh and the stage of Nash'ah. However, in "Al-Qiyamah" and "Al-Infitar" no sixth stage is mentioned. This indicates that male and female sex differentiation continues to its completion and this is what actually

happens. The external genital organs differentiate between the 11th and 12th weeks Similarly "*Ta'dil*" or modification of the organs and acquiring of human proportions of the body continues to a late stage of pregnancy.

9. The Quran and the Ancient Greeks - A Comparison

Having examined most of the verses related to Embryology in the Qur'an and Hadith we are now in a position to make a full comparison with Galen's text on embryology. Hence, we have summarised the main embryological ideas according to the Qur'an/Hadith, Galen, Indian antiquity, Hippocrates and Aristotle in the tables 2 & 3 below.

TABLE 2

Qur'an/Hadith and Embryology		**Galen and Embryology**
Main terms & developments	**Associated terms & developments**	
Al-Dafq (Forceful Emission of Fluid, self emitting)		The alterative faculties or power which took the primitive unformed material and changed it into the different forms
Sulalah min ma'a (Gentle Extraction from fluid)		The effects of the faculties divided into three genesis, growth and nutrition
Nutfah (A drop of liquid)	Al-Nutfah Al-Amshaj (a mixture of male and female germinal fluids or cells)	Embryo not thought to be formed by a combination of menstrual blood and semen. Umbilical cord acted as a root
	Al-Khalq (Beginning of a human individual from the fertilised ovum)	
	Al-Taqdeer Determination of characters (Nutfah Idha Tumna)	
	Sex determination	Embryonic development divided into four

	A part of a Nutfah	stages: (1) an unformed seminal stage (geniture) as seen in dissections and abortions. Not yet called a foetus but semen
	Al-Ghaydh (Decrease or penetration in amount of male and female secretions which penetrate into the uterus and uterine tubes)	
	Al-Harth (Ploughing & Sowing, it implies implantation)	2) a flesh blood filled stage in which the tria principia are engendered, the heart, liver and brain without shape. Now called a foetus
	Quarar Makeen (The uterus - A place of settlement firmly fixed)	
	Three veils of darkness	
Alaqah (Leech like structure or any thing suspended or attached to a surface)		3) a stage when all the other parts are mapped out and it is possible to see the thre ruling parts clearly and a kind of outline, a silhouette, as it were, of all the other parts. The conformation of the three ruling parts i seen more clearly, than the stomach and limbs. Limbs later form "twigs", as Hippocrates expressed it, indicating by the term their similarity to branches.
Mudghah (Chewed liked Substance: referring to the somite stage of development)	Khalaq (creation, formation, initiation). Mokhalaqa wa Ghair Mokhalaqa (differentiated and partly undifferentiated)	(4) a stage when the limb parts have become clearly visible Puer. The fourth and final period is at the stage when all the parts in th limbs have been differentiated; and at this part Hippocrates the marvellous no longer calls the foetus an embryo only, but already a child, too when he says that it jerks and moves as an animal now fully formed
Izam (Bone formation)	Sawwa (To make even and straight)	Comparison of the embryo to a plant
Al-Kisa Bil-Lahm (The Skeleton	Adddala (modification and further straightening)	Plant to animal conversion of the embryo with the umbilicus acting as a root

becomes clothed with muscles)	(Two sexes are made i.e. differention into ovary or testes occurs)	
Al-Nash'ah (To initiate and cause to develop)		Embryo respired through the umbilical cord and excreted urine into the allantois. The association of male and female conception with opposite sides of the womb
Izdiad Al-Rahem (Increase in the size of the uterus)		Female semen forms the allantoois and the coagulation of male and female semen in the uterus results in the formation of the chorion. .
Al-Hadanah al-Rahemiah (Uterine support)		Embryo blood passes from the heart to the lungs and not vice versa. Respiration occurs via the umbilical cord
Al-Qabliyah lil Hayah (Viability)		Embryo Waste excreted into the allantois
Tayseer Assabil (Making the passage easy)		Male foetuses were believed to form quicker than female ones because of the male germs superior heat and dryness.
Dominant and recessive characters		Food could affect embryo development.
Gross congenital deformities		Dry foods eaten by the mother, were proposed to lead to a more rapid development of the foetus than other kinds
Construction of facial features		

Comparison of the Qur'an with Galen

The authenticity and uniqueness of the Qur'an has been questioned by claiming that the ***Nutfah*** has been plagiarised from Galen's geniture or unformed seminal stage. However, when we compare the two, the Qur'an does not mention ***Nutfah*** as unformed semen**,** but describes ***Nutfah*** as a drop and then goes into far greater detail than Galen's simple observation. As summarised in the table 2, the Qur'an and Hadith discuss a self emitting fluid and the ***Nutfah*** as a drop or small part of fluid, the concept of ***Al-Nutfah Al-***

Amshaj or mixed germinal drop is also mentioned. Further points such as, the ***Nutfah*** and its place of settlement (***Quarar Makeen***), the three veils of darkness, a gentle extraction, ***Khalaqah*** (creation), ***Qadarah*** programming, sex determination, the concept of part of a ***Nutfah***, ***Al-Ghaydh*** and ***Al-Harth*** or implantation are all discussed by the Qur'an. Moreover all of these points are in agreement with modern embryological knowledge. It is obvious that there is no evidence of plagiarism from Galen. Galen's simple observation in no way compares to the depth and detail given in the Qur'an and Hadith regarding the ***Nutfah***.

The term ***'Alaqah*** has been compared with the following statement by Galen.

As discussed earlier Galen states

"But when it has been filled with blood, and heart, brain and liver are still unarticulated and unshaped yet have by now a certain solidarity and considerable size, this is the second period; the substance of the foetus has the form of flesh and no longer the form of semen."

In reality this attempt at a comparison is a distortion, as the Qur'an dos not mention unarticulated heart, brain, liver or a fleshy form, it discusses ***'Alaqah*** as a clinging or suspended thing, or a leech like structure as stated above. The only similarity is that Galen mentions blood and some commentators have translated ***'Alaqah*** as a blood clot. However, when we examine the original usage of this word, we find that ***'Alaqah*** does not mean blood (the word ***Dam*** is used in Arabic for blood), but because of certain properties of blood, it was, besides other things also used to imply blood.

In the classical Arabic dictionary, *Al-Qa'moos Al-Muhit* (Ref: 7D) it states that ***'Alaqah*** is; blood in its normal state or blood which is extremely red or which has hardened or congealed, a piece thereof; every thing that sticks; clay that sticks to hands; unchanging enmity or love; Zu `alaq is the name of a hill of Banu Asad, where they attacked Rabi`ah ibn Ma'lik; An insect of water that sucks blood; that portion of a tree that is within the reach of animals.

***`Alaqah*** is also described in similar terms in Hans Wehr's Dictionary of Arabic (1961: Ref: 8D) and in the great classical dictionary *Lisan Al`Arab* (Ref: 4D). So the real meaning of the word, from an analysis of all the meanings stated above, is anything that sticks to or hangs with something else. The word was used for blood, because of the well known property of blood (or Dam in Arabic) being sticky, as soon as its starts to dry out. The word was used for mud, because of its obvious property of sticking to the hands. The word was used for unending hatred or love, because such emotions stick to one's heart. The word was used for a small insect which sucks blood (leech), because it sticks to its prey. The word was also used for that part of the tree, which is in the reach of grazing animals, because the animals stick to that part of it.

When the Qur'an says: "He created man of ***`Alaqah***", it was interpreted by Muslim scholars to imply "a clot of blood". This was not because the word meant "a clot of blood" as we have already discussed, but because the

Muslim scholars felt that in this verse it implied "a clot of blood". If, due to the widening of human knowledge, today we are in a position to know that a child is never "a clot of blood", all that has happened is that we can now safely say that the interpretation of the Muslim scholars was not accurate. If the Qur'an was not available in its original language, the Muslims would have had no option but to submit that the Qur'an does have a "scientific error" in it. The case of the Qur'an, however, is very different from other so-called "revealed" books, as it is still in its' original language.

Another argument raised is that scholars of the Qur'an have been "forced" to translate ***Alaq*** in Sura 96:2 as a "clot", as opposed to leech like or clinging thing, because of the use of a singular *Alaqah* elsewhere. However, this type of argument is completely erroneous, as even a little knowledge of classical Arabic will show that ***Alaqah*** and ***Alaq*** can have the same translation. There is no such thing as a "forced translation" in the Qur'an. In reality, different meanings can be derived from the same word in many instances in the Qur'an. However, the process of deriving new meanings is always carried out in accordance with the strict rules of Arabic grammar, so that it is impossible to assign any fanciful meaning to a word.

The attempt to compare the Qur'anic term ***Mudghah*** with the following passage from Galen are similarly based on a very superficial understanding of the term ***Mudghah*** and the other words associated with it such as ***Khalaq*** and ***Mokhalaqa wa Ghair Mokhalaqa..***

Galen states

"The third period follows on this, when, as was said, it is possible to see the three ruling parts clearly and a kind of outline, a silhouette, as it were, of all the other parts. You will see the conformation of the three ruling parts more clearly, that of the parts of the stomach more dimly, and much more still, that of the limbs. Later on they form "twigs", as Hippocrates expressed it, indicating by the term their similarity to branches."

As discussed above the Qur'an mentions ***Mudghah*** as a chewed like substance, partly formed and partly unformed. Whereas, Galen talks about the conformation of the three ruling parts, silhouettes and twigs/limbs. He also discusses seeing the three ruling parts more clearly than the stomach and the limbs. Galen makes no mention of a chewed like substance or uses a equivalent terms to ***khalaq*** (creation, formation, initiation), ***Mokhalaqa wa Ghair Mokhalaqa*** (differentiated and partly undifferentiated) or ***fa*** (indicates a quick sequence of events). Even a basic analysis of the two texts shows that they are very obviously different.

The term ***Al-Nash'ah*** (another development) mentioned in the Quran has been said to correspond to with the following passage from Galen.

"The fourth and final period is at the stage when all the parts in the limbs have been differentiated; and at this part Hippocrates the marvellous no longer calls

the foetus an embryo only, but already a child, too when he says that it jerks and moves as an animal now fully."

Again, we find that on closer examination there are no similarities between the texts or evidence of plagiarism. Galen talks about limb differentiation and the embryo becoming a fully formed child. However, the Quranic usage of "***Ansha'a*** as explained earlier, means to initiate and cause to develop. Furthermore the terms ***Sawaak*** and ***Fadalak*** (to make even and straight) are used in the Qur'an, but there are now corresponding ideas to be found in the Greek work.

So the question of the Prophet and Messenger Muhammad (Allah bless him a give him peace) plagiarising ancient Greek ideas is completely illegitimate.

The main embryological ideas of Hippocrates, Aristotle and the ancient Indians have been summarised in Table 3 below. If one compares these theories with the Qur'an, it is perfectly clear that no plagiarism has occurred.

Table 3

Indian Embryology	Hippocratic Embryology	Aristotle and Embryology
Embryo formed by mixture of semen & blood	All natural bodies consist of fire and water	Concept of the menstrual blood coagulating to form the embryo
Semen and blood both of which originate from chyle (digested fats).	Embryo formation by fire	Embryonic development compared to the action of rennet and yeast
3rd month differentiation into arms and head	Nourishment obtained from the food and breath introduced into the mother	Fetation said to behave like seeds sown in the ground
4th month development of thorax, abdomen and heart	Everything in the embryo is formed simultaneously	From the heart blood-vessels extend all over the body
6th month hair, nails, sinews and veins	Embryos develop and become visible at variable times (40 days, others in 2, 3, or 4 months)	Formation of the uniform parts is effected cooling and heat
7th other things develops	Both partners alike contain both male and female sperm	Some things " set" by the cold and some by the
8th vital force (ojas)	Sperm is said to come from the whole body of each parent, weak coming from the weak parts, and strong from the strong parts	Cold which sets " the flesh, and that is why fire dissolves it
Hard parts body are derived from the father,	Embryo is nourished by maternal blood,	Nails, horns, hoofs and bills etc are formed by heat evaporation fluid
Soft parts created from the soft from the mother	Blood coagulates, forming the embryonic flesh	Sinews and bones (like earthenware) are formed, as the fluidity solidifies, by the agency of the internal heat

Embryo created from The father's semen menstrual blood (artava)	Bones grow hard due to coagulating action of heat	Heat and cooling are both employed by Nature as the motive force behind embryo creation
The atman, or subtle body (consisting of fire, earth, air and water)	Head begins to project from the shoulders, and the upper and lower arms from the sides	Concurrent growth and differentiation described as:
The manas or mind, united to a particular embryo by reason of its karma	Legs separate from each other, sinews spring up around the joints.	The upper portion of the body is the first to be marked off in the course of the embryo's formation
	Mouth opens up**.**	The lower portion receives its growth as time goes on
	Nose and ears project from the flesh and become perforated	In the early stages the parts are all traced out in outline
	Eyes are filled with a clear fluid	Later they get their various colours and softnesses and hardnesses
	Sex of genitals becomes plain	The heart is the first part of the whole animal to be formed
	Upper portions of the body now respire through the mouth and nostrils	Cold causes the brain to "set,"
	Passage outside is formed from the belly and intestine through the anus	Males are generated on the left-hand side of the womb, and females on the right hand side
	Period of articulation (the period in which the limbs are differentiated) is forty-two days for the female and for a boy thirty days or even twenty days	
	Process of growth in plants and in humans is exactly the same	
	Food can affect embryo growth	

10. Conclusion

After reviewing the ancient Greek ideas about embryology in more detail, summarising their main features in the above tables, and comparing them with the Qur’an, it becomes perfectly obvious, even to the casual reader, that

the embryological works of Hippocrates, Aristotle and Galen etc. are completely different to that of the Qur'an.

The fact is that the Qur'an discusses many different aspects of embryology as summarised in Tables 1 & 2 using terms and expression which have no comparison in the other ancient literature. A further point to bear in mind is that the Qur'an has its own unique style. The Arabic language of the Qur'an is very poetic and rhythmic, whereas we do not find the ancient Greeks discussing embryology in any particular form or poetry.

In conclusion, the Qur'an, is totally different in terms of style, subject matter and accuracy. Hence the accusation that the Prophet and Messenger Muhammad (Allah bless him and give him peace) plagiarised ancient Greek ideas is not based on any credible evidence or sound reasoning but is the result of biased and subjective interpretation. The claim is thus utterly refuted.

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